

Botanical and Phytochemical Study on Leaves of *Solanum torvum* Swartz.(Kazaw-kha)

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Abstract

Solanum torvum Swartz.(Kazaw-kha) is a perennial prickly shrub belonging to the family Solanaceae. The plant was used as a medicine for curing asthma, diabetes, hypertension and fever. In this study, the plants were collected from Hinthada University Campus during June to November, 2016. Precise location of specimens collection were made Map Navigator by using Global Positioning System (GPS) device. The morphology of vegetative parts as well as reproductive parts were studied and identified by using standard literatures and internet informations. In phytochemical screening, the presence of alkaloid, glycosides, saponin, reducing sugars, steroid, phenolic compound, α -amino acid, carbohydrate, tannin and protein were detected. Cyanogenic glycoside, terpenoid, flavonoid and starch were absent in the powdered samples. And also physico-chemical properties of the powdered samples were determined by using the method given in Harbone (1989). Elemental analysis of powdered leaves were carried out by Energy Dispersive X- rays Fluorescence (EDXRF) spectrophotometer. In this result, the highest concentration of the element was found to be potassium (K). The content of heavy metals were analyzed by using AAS; these results showed higher content of calcium (Ca). The nutritional values from powdered leaves of *Solanum torvum* Swartz was determined by using AOAC methods.

Keywords: *Solanum torvum* Swartz. (Kazaw-kha), Morphology, Phytochemical screening, and Nutritional values

INTRODUCTION

Family Solanaceae consists of about 85 genera and 2200 species. The members of this family are primarily distributed in tropical America and South America, but they are also well represented in temperate regions. The largest genus of the family is *Solanum* which includes about 1500 species. (Pandey, 1999) *Solanum* spp. are not only economically important crops, but they are also medicinally and ornamentally valuable. (Website-1)

Solanum torvum Swartz is a shrub and is commonly named Kazaw-Kha. (John Kress, 2003). *Solanum torvum* Swartz is a wild type and distributed throughout Myanmar and abundantly found in Hinthada Townships. It is located in Hinthada District of Ayeyarwady Region. This plant is commonly called Turkey berry, Cherry eggplant, Pea eggplant, Tandang-aso and Taogotan (Website-2). It is well known for its medicinal values because of the presence of alkaloids and other compounds (Website-3).

The plant is sedative and diuretic and the leaves are used as a haemostatic. This plant is native to South America and were brought to Europe. (ChristopeWirart, 2006). In Indonesia *S. torvum* is considered one of the best vegetable side-dishes to be eaten with rice. The steroidal alkaloid solasodine, which is used in the manufacture of steroidal sex hormone for oral contraceptives, is present (0.84%) in the leaves and fruits. (Siemonsma, 1994)

MATERIALS AND METHODS

The specimens were collected from Hinthada Township. They were collected during the flowering and fruiting periods throughout in the year, 2016. The fresh parts of this plant were used for morphological characters.

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The collected specimens were washed with water to remove impurities. After washing, the specimens were weighed and air dried at room temperature and weighed intermittently. When constant weight was obtained the samples were completely dried. Then specimens were pulverized by grinding machine and stored in air tight containers to prevent moisture changes, contamination and kept for phytochemical screening (Harbone, 1989).

RESULTS

Scientific Name	-	<i>Solanum torvum</i> Swartz.
English Name	-	Turkey berry
Myanmar Name	-	Kazaw-kha, Myobyet-kayan
Family	-	Solanaceae

Morphological Characters of *Solanum torvum* Swartz.

Habit: Evergreen, perennial prickly shrub or small tree, about 3-10 ft, widely branched; leaf: simple, alternate, about 2.5-25 cm long and 1.8-42 cm wide, petiolate, about 0.8-9 cm long, exstipulate and covered with short hairs, leaf blade ovate to elliptic, margins with broad lobes, bases unequal, apex acute, surfaces densely stellate hairy below, less dense above; inflorescence: terminal and axillary many flowered panicle cymes, peduncle mostly 1 or 2 branched, short, about 0.1-0.4 cm long; flower: white, actinomorphic, bisexual, hypogynous, ebracteate, ebracteolate, pedicellate, about 0.5-1.3 cm long; sepals: 5 synsepalous, persistent, about 0.5 cm long and 0.3 cm wide; petals: 5, synpetalous, white, petalostemonous, funnel shaped, persistent, about 0.6-1.5 cm long and 0.6-0.9 cm wide; stamens: 5 prominent anther inserted on corolla throat, filament short, about 0.2 cm long, anther long, about 0.7 cm long, basifixed; carpels: 2, bicarpellary, syncarpous, ovary ovoid, superior, bilocular, many ovules in each locule in T.S, placentation axile, style long, about 0.9 cm long, stigma bi-lobed; fruits: subglobose berry, smooth, glabrous, about 1-1.4 cm long; seeds: discoid, about 0.1 cm broad, smooth, yellowish-brown in colour, pepper-like in odour, taste bitter. Flowering and fruiting period: throughout the year.

Preliminary Phytochemical screening of powdered samples

In phytochemical screening; the presence of alkaloid, glycosides, saponin, reducing sugars, steroid, phenolic compound, α -amino acid, carbohydrate, tannin and protein were detected. Cyanogenic glycoside, terpenoid, flavonoid and starch were absent in the powdered samples of *Solanum torvum* Swartz. In the analysis of EDXRF method, Potassium (K), Calcium (Ca), Sulphur (S), Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn) and Strontium (Sr) were found in powdered sample of leaves. According to AAS method, the presence of Calcium (Ca) was the highest concentration and the lowest concentration was Cupper (Cu). In the determination of nutritional values; *Solanum torvum* Swartz powdered leaves, the highest amount of carbohydrate were found. These results were shown in Tables (1) to (5).



Habit



Inflorescence



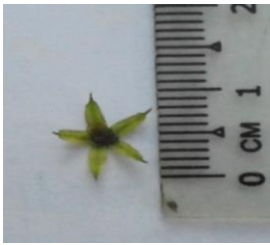
L.S of Flower



Upper surface of leaves



Lower surface of leaf



Sepal



Petal



Stamen



Pistil



T.S of Ovary



Fruits



Seeds

Figure (1). *Solanum torvum* Swartz.

Table (1). Preliminary Phytochemical Screening of powdered samples of the leaves from *Solanum torvum* Swartz.

No.	Chemical Constituents	Extract	Reagent used	Leaves	
				Observation	Result
1.	Alkaloid	EtOH	1. Mayer's 2. Wagner's 3. Hager's	White ppt Orange ppt Yellow ppt	+
2.	Glycoside	EtOH	H ₂ O+NaOH	White ppt	+
3.	Reducing sugar	H ₂ O	Fehling's solution A and B	Reddish ppt	+
4.	Saponin	H ₂ O	Distilled water	Marked frothing	+
5.	Cyanogenic glycoside	H ₂ O	Conc: H ₂ SO ₄ , Sodium picratepaper	No colour change	-
6.	Steroid	EtOH	CHCl ₃ + Conc: H ₂ SO ₄ acid	Green colour	+
7.	Terpenoid	EtOH	CHCl ₃ + Conc: H ₂ SO ₄ acid	No colour change	-
8.	Phenolic compound	EtOH	10% FeCl ₃	Brown colour	+
9.	Flavonoid	EtOH	HCl/Mg	No colour change	-
10.	α -amino acid	H ₂ O	Ninhydrin	Violet colour	+
11.	Carbohydrate	H ₂ O	Benedict's solution	Brick red ppt	+
12.	Tannin	H ₂ O	5% FeCl ₃	Yellow brown ppt	+
13.	Starch	H ₂ O	I ₂ KI	No colour change	-
14.	Protein	H ₂ O	Millon's reagent	Brown ppt	+

+ = Present

- = Absent

Table (2). Physico-chemical characterization of powdered sample of leaves of *Solanum torvum* Swartz.

No.	Physico-chemical properties	Quantity determined
1.	Moisture content	14.47
2.	Total ash content	8.38
3.	Acid insoluble ash content	32.24
4.	Water soluble ash content	35.58
5.	Ethanol soluble matter content	11.9
6.	Methanol soluble matter content	17.4
7.	Pet-ether soluble matter content	1.5
8.	Ethyl-acetate soluble matter content	3.0
9.	Chloroform soluble matter content	3.0
10.	Acetone soluble matter content	4.1
11.	Aqueous soluble matter content	10.6

In this experiment, the yield of methanol was found more than other soluble matters. The yield of pet-ether was less soluble than other soluble matters.

Table (3). Elemental analysis of powdered leaves of *Solanum torvum* Swartz. by using EDXRF

No.	Sample Elements	Average (%W/W)
1.	Potassium (K)	0.427
2.	Calcium (Ca)	0.314
3.	Sulphur (S)	0.042
4.	Iron (Fe)	0.022
5.	Manganese (Mn)	0.001
6.	Copper (Cu)	0.001
7.	Zinc (Zn)	0.001
8.	Strontium (Sr)	0.001
9.	Rubidium (Rb)	0.000

Table (4). Elemental analysis of powdered leaves of *Solanum torvum* Swartz. by using AAS results.

No.	Elements	Mg/l
1.	Ca (Calcium)	1.995
2.	Mn (Manganese)	0.154
3.	Pb (Lead)	0.005
4.	Mg (Magnesium)	1.775
5.	Cr (Chromium)	0.003
6.	Cd (Cadmium)	0.009
7.	Zn (Zinc)	0.106
8.	Cu (Copper)	0.003

In this research work, the medicinal plant parts were determined by Atomic Absorption Spectrometry (AAS) method. Analytical assay of the samples were contained.

Table (5). Nutritional Values of the powdered leaves of *Solanum torvum* Swartz (According to FIDSL).

Sr.No.	Test Parameter	Test Method	Result Leaves
1.	Moisture	AOAC-2000(930.04)	11.84%
2.	Ash	AOAC-2000(930.05)	8.85%
3.	Crude Protein	AOAC-2000(920.152) (Kjeldahl Method)	19.23%
4.	Crude Fiber	AOAC-2000(978.10) Fiber Cap Method	12.57%
5.	Ether Extract (Crude Fat)	AOAC (Buchi Soxhlet Method)	2.61%
6.	Carbohydrate	By Difference	44.90%
7.	Energy Value (Kcal/100g)		283

In the determination of nutritional values, the powdered leaves in *Solanum torvum* Swartz. were found as shown in according to table (5).

DISCUSSION AND CONCLUSION

In this paper, the morphological characters of both vegetative and reproductive parts, the preliminary phytochemical investigations were conducted. *Solanum torvum* Swartz. is perennial prickly shrub, widely branched; leaf simple and alternate, exstipulate, margin with broad lobes, surfaces densely stellate hairy below less dense above. The flowers are white, ebracteate, calyx persistent, corolla white, stamens 5 with prominent anther, ovary ovoid, fruit berry. These characters are in agreement with Hooker, 1885; Qui-ming, 2009.

The results of preliminary phytochemical analysis of *Solanum torvum* Swartz showed that the presence of alkaloid, glycoside, saponin, reducing sugar, phenolic compound, α -amino acids, carbohydrate, tannin and protein were detected. These characters are in agreement with those given by Website (3) and (4). Christophe Wiart, 2006 and Siemonsma, 1994 also revealed the presence of steroidal alkaloids in leaves of *Solanum torvum* Swartz. Cyanogenic glycoside, terpenoid, flavonoid and starch were absent in its leaves.

In physico-chemical properties, the most soluble matter content of the powdered samples was in methonal and least soluble in pet-ether. In this result of the Elemental Analysis of (EDXRF), Spectrum from powdered samples of leaves consist of Potassium (K), Calcium (Ca), Sulphur (S), Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn) and Strontium (Sr) were found.

The elemental analysis of powdered leaves sample carried out by Atomic Absorption Spectrophotometer (AAS) showed that the presence of high elemental concentration was Calcium (Ca) and the lowest concentration was Cromium (Cr) and Copper (Cu).

In the determination of nutritional values, it was found that the powdered leaves in *Solanum torvum* Swartz moisture, consist of ash, crude protein, crude fiber, crude fat, carbohydrate and energy values.

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